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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/871,463	05/31/2001	Charles R. Spinner III	01-P-002 (STMI01-00013)	9805

30425 7590 06/27/2002

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EXAMINER
WARREN, MATTHEW E

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 06/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/871,463	SPINNER III, ET AL.	
	Examiner	Art Unit	
	Matthew E. Warren	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 May 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *1-7* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 May 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to the Election filed on May 9, 2002.

Election/Restrictions

Applicant's election with traverse of Group I, claims 8-20 in Paper No. 3 is acknowledged. The traversal is on the ground(s) that independent claim 8 does not require removal of any portion of a barrier layer but reads on the structure prior to CMP. This is not found persuasive because the applicant claims two separate and distinct inventions. Distinction being defined as (1) the process claimed is used to make another product or (2) the product claimed can be made by another process. Since it has been clearly shown that the product of claim 8 can be made by a process other than that of claim 1, the requirement is still deemed proper and is therefore made FINAL.

Claims 1-7 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 3.

Drawings

Figures 3A-3C should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid

abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 16-18 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Gillespie (US 6,175,154 B1).

Claims 8-14 and 16-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Marcyk et al. (US 6,103,625).

Marcyk et al. shows (fig. 3A) a portion of an integrated circuit comprising a dielectric layer (302) over a substrate (300), a conformal tungsten layer (304) over the dielectric layer and within openings of the dielectric layer, and a protective barrier layer (308) over the tungsten layer. The protective barrier layer is a nitride (such as titanium nitride) or a refractory metal (titanium is known to be a refractory metal) (col. 5, lines 19-30) and therefore inherently comprises a material for which removal by mechanical

polishing is primarily mechanical. The portion of the tungsten layer in the opening is thicker than the portion of the tungsten layer over the dielectric layer. The barrier layer overlies the entire tungsten layer. In another embodiment (fig. 3B) the barrier layer (308) only overlies portions of the tungsten layer within the opening but not portions over the dielectric layer. In one embodiment, the conductive layer (tungsten layer) has a thickness between 4500 and 8000 Angstroms (col. 3, lines 61-62) and the barrier layer has a thickness between 100 and 800 Angstroms (col. 4, lines 22-23).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 15 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marcyk et al. (US 6,103,625) as applied to claims 8 and 16 above, and further in view of Van Buskirk et al. (US 6,346,741 B1).

Marcyk shows all of the elements of the claims except the opening in the dielectric being sized to form a capacitive electrode from the tungsten within the opening. Van Buskirk et al. shows. (fig. 1H) shows a capacitor device comprising a tungsten electrode contact (18) and a tungsten top electrode (44) formed in dielectric layer (18 and 35) openings. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the tungsten interconnect of

Marcyk by incorporating that interconnect as a capacitor electrode because Van Buskirk teaches that tungsten interconnects suitably function as capacitor electrodes.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marcyk et al. (US 6,103,625) as applied to claim 16 above, and further in view of Joshi et al. (US 5,889,328).

Marcyk shows all of the elements of the claims except the tungsten and barrier layer form an upper surface which is planar with an upper surface of the dielectric layer. Joshi et al. shows (fig. 7B) shows an interconnect structure in which a low resistive metal layer (16) (which includes tungsten) and capping layer (17) (being titanium is formed in a via hole and is coplanar with an upper surface of a dielectric layer (15) (col. 10, lines 13-30). Such a configuration results in conductors that are corrosion-free, resist electromigration wear, and reduced cumbersome dielectric planarization steps (col. 3, lines 50-55). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the tungsten interconnect of Marcyk by forming the tungsten and titanium barrier layer to be coplanar with an upper surface of a dielectric layer as taught by Joshi to form conductors that are corrosion-free, that resist electromigration wear, and have minimal dielectric planarization steps.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Choudhury (US 5,614,437) also shows devices having tungsten plugs and titanium protective barrier layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (703) 305-0760. The examiner can normally be reached on Mon-Thurs, and alternating Fri, 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

MEW

June 24, 2002

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800